

Medicinal plants in La Gamba and in the Esquinas rainforest

Plantas medicinales en La Gamba y de la selva tropical Esquinas

Reinhard LÄNGER

Abstract: Tropical rainforests are valuable sources for plants used in traditional medicine in many regions of the world. Although the Esquinas rainforest in the Southwest of Costa Rica is renowned for its biodiversity, it is not a primary source of medicinal plants for the local population. A great number of traditionally used plants are cultivated in domestic gardens in La Gamba, and the knowledge of their use is kept and promoted by a group of women called 'mujeres visionarias'. Examples of the use of important plants and problems associated with the documentation of the traditional knowledge are discussed.

Key words: Costa Rica, Esquinas rainforest, ethnomedicine, medicinal plants.

Resumen: Las selvas tropicales son una valiosa fuente de plantas usadas en la medicina tradicional en muchas regiones del mundo. Aunque la selva tropical Esquinas en el sudoeste de Costa Rica es renombrada por su biodiversidad, no es la principal fuente de plantas medicinales para la población local. Un gran número de plantas usadas tradicionalmente son cultivadas en los jardines de La Gamba, y el conocimiento de su uso se mantiene y promociona por un grupo de mujeres llamadas "mujeres visionarias". Se discuten ejemplos del uso de importantes plantas y problemas asociados con la documentación del conocimiento tradicional.

Palabras clave: Costa Rica, selva tropical Esquinas, etnomedicina, plantas medicinales.

Introduction

In Europe there is a popular myth that tropical rainforests contain the buried treasure of medicines for the future. The biological diversity is a plausible explanation. However, several efforts even of large pharmaceutical companies failed to provide any evidence. This is also true for Costa Rica.

In contrast to the search for modern medicines, people living in or close to rainforests are an important source of knowledge on traditional healing. The need for a broad documentation of the traditional use of herbal medicinal preparations is reflected in the legislation of the European Union. In 2004, the legislation on medicinal products has been amended, and it is now possible to apply for registration of traditional herbal medicinal products in all member states of the European Union. An essential background is the documentation of the traditional medicinal use. Only 15 years of use within the European Union are necessary, with the evidence for at least a further 15 years' tradition anywhere across the world being admissible. Any written documentation is therefore valuable.

While in recent decades herbal products have become highly popular in 'western' countries of the world,

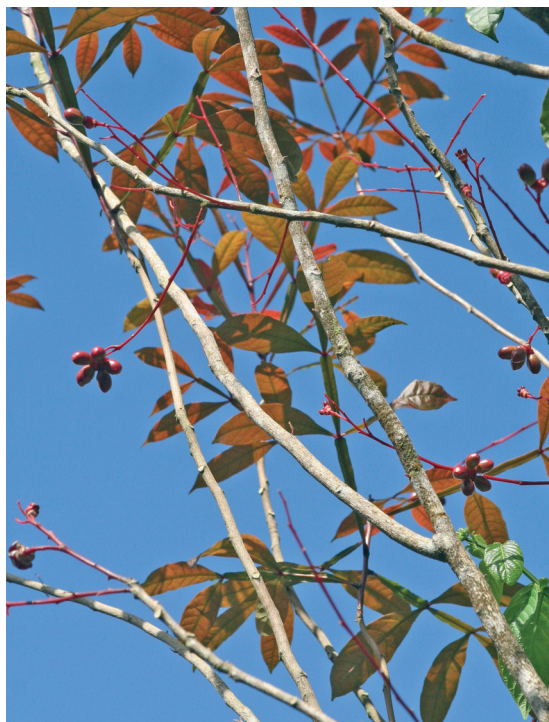
in Costa Rica the confidence in modern synthetic drugs increased. As a consequence, knowledge of the traditional use of medicinal plants decreased continuously. Additionally, for people in the south-west of Costa Rica, the Esquinas rainforest is not a primary source for medicinal plants. This is partly due to the history of settlement in this region: most people have their roots in the dry north of Costa Rica. They moved to La Gamba seeking employment in the banana plantations. The simplified possibilities of global exchange of information resulted in a mixture of public knowledge of very different origin and quality. In recent years, a return to the traditions can be observed, including in Costa Rica. Women especially, mostly in small co-operatives, try to pass down their knowledge.

This contribution tries to give an overview about medicinal plants in the Esquinas rainforest as well as about the local value of traditional healing in La Gamba.

Medicinal plants and related species in the Esquinas rainforest

The Esquinas rainforest is the habitat of several species or genera with therapeutic potential and with importance in traditional medicine (occurrence of

Fig. 1: *Quassia amara* (Simaroubaceae), hombre grande



species and genera according to WEBER et al. 2001; references for traditional indications: ARVIGO & BALICK 1998, CÁCERES 1996, EARLE 2001, PRIDUN 2001, WIENERROITHER 2000):

Quassia amara (Simaroubaceae, hombre grande, Fig. 1): In Costa Rica, *Quassia amara* has a long pre-Columbian history; it was one of the most important

febrifuges of the indigenous people. Most of the Indians used the bark as panacea, which is reflected in the traditional indications (digestive disorders, as anthelmintic, as an insecticide, for 'purification' of the blood, menstrual problems as well as against poisonous snakebites). The intensely bitter constituents like the terpenoid quassin make the use as a stomachic plausible, recent investigations confirmed the insecticide and anti-malaria activity. The Costa Rican herbal medicinal product containing an extract of the bark (Q-assia®) is promoted for the immuno-stimulating effects and for digestive problems. This product is the result of several years of joint research by companies and INBio supported by the Interamerican Development Bank and other sponsors. The royalties generated from the sale of the product are divided between SINAC (National system for conservation areas, to support conservation of protected areas in Costa Rica) and INBio (in order to continue the generation of information about biodiversity and sustainable use).

Senna reticulata, *Senna alata* (Fabaceae, saragundi, Fig. 2): All species of the genus *Senna* contain hydroxyanthraquinones with laxative properties. Additionally *Senna alata* is a traditional herbal remedy against urinary tract conditions. In low concentrations, an infusion of the leaves is used to cure diarrhoea. Young leaves are rubbed onto insect bites to stop itching.

Hamelia patens (Rubiaceae, colorarito): Leaves, flowers and stems are used to treat problems of the skin



Fig. 2: *Senna reticulata* (Fabaceae), Saragundi



Fig. 3: *Metaxya rostrata* (Metaxyaceae)



Fig. 4: *Neurolaena lobata* (Asteraceae), gavilana

like sores, rash, burns, itching, cuts, fungus and insect bites. The constituents (alkaloids, steroid glycosides, flavonoids) show strong antibacterial and antifungal activity.

Guazuma ulmifolia (Sterculiaceae, mutamba): The bark contains large amounts of tannins; the traditional use against dysentery and several skin disorders is comparable to the use of tannin-containing plants in the traditional European medicine.

Urera sp. (Urticaceae, ortiga): Spine-like prickles are scattered all over the plant, the touch causes excruciating pain, which may last for three days. Like the European stinging nettle (*Urtica dioica*) *Urera* species are used to cure arthritis and muscle pain.

Metaxya rostrata (Metaxyaceae, Fig. 3): this fern is traditionally used against cancer in the intestinal tract. A first in-vitro screening at the University of Vienna revealed that some extracts may induce apoptosis (VIRT-BAUER 2007).

Neurolaena lobata (Asteraceae, gavilana, Fig. 4): This is one of the most prominent native medicinal plants. This member of the Asteraceae contains bitter tasting sesquiterpene lactones. The traditional use is similar to prominent members of the Asteraceae family in Europe (chamomile, yarrow): externally as an aid for wound healing, internally as a tonic, against gastrointestinal complaints, as a febrifuge and against intestinal parasites. The sesquiterpene neurolepin showed promising research results against malaria (PASSREITER & ALDANA 1998).

Bixa orellana (Bixaceae, achiote, Fig. 5): The seeds contain bixin, a red or orange lipophilic carotenoid, which is allowed as food colouring (Code E160b). *Bixa* seeds are traditional used as body paint, to prevent mosquito bites and to protect from sunburn. It is said to be an antidote to cyanide poisoning, which is occasionally caused by poisonous manioc (*Manihot esculenta*). There are numerous traditional medicinal indications reported from all parts of the plant. Reports on scientific research of pharmacological activities are rare.

Bursera simaruba (Burseraceae, indio desnudo, Fig. 6): There is only a little scientific evidence for the traditional use of the bark and the leaves. The bark acts against diarrhoea due to the content of tannins; externally it is used for example as an antidote to poison-wood sap.

Genera of medicinal interest:

Paullinia sp. (Sapindaceae): The seeds of *Paullinia cupana*, native to the Amazon region, serve as source for the production of guarana, a paste containing up to 6% caffeine.



Fig. 5: *Bixa orellana* (Bixaceae), achiote

Smilax sp. (Smilacaceae): Central America was a major source for the herbal drug 'Radix Sarsaparillae' which has been used against genital diseases. All of the world-wide c. 200 species contain steroid saponins. While sarsaparilla is now obsolete in phytotherapy, it is still widely used in traditional medicines in Central America, South America, India and China in the same manner.

Terminalia sp. (Combretaceae): In contrast to traditional Chinese medicine, where the fruits of *Terminalia chebula* are used against diarrhoea and cough, in Central



Fig. 6: *Bursera simaruba* (Burseraceae), indio desnudo



Fig. 7: *Psychotria* sp. (Rubiaceae)



Fig. 8: *Mucuna* sp. (Fabaceae)

Fig. 9: Doña Sara



America infusions of the leaves of *Terminalia* sp. are ingested against high blood pressure and 'troubles' with the heart.

Passiflora sp. (Passifloraceae): Passion-flowers are native to Central America; some species are cultivated for their tasty fruits. The medicinal use is negligible in Central America, but in Europe numerous herbal medicinal products containing extracts of *Passiflora incarnata* are authorised for the treatment of nervousness and as an aid to sleep.

Psychotria sp. (Rubiaceae) (Fig. 7): The roots of *Psychotria ipecacuanha* which is native to Brazil and Bolivia contain alkaloids (emetin, cephaelin), which act in low doses as an expectorant, while in higher doses vomiting is caused. Ipecacuanha syrup is traditionally used as an aid in cases of oral intoxication.

Cecropia sp. (Cecropiaceae): From numerous species of the genus *Cecropia*, promising results of pharmacological tests have been published (antidiabetic (ANDRADE-CETTO & HEINRICH 2005), antidepressant-like, spasmolytic, wound healing). An infusion of the leaves is traditionally used against high blood pressure, dropsy, as a liver tonic (combined with papaya) and for kidney complaints.

Mucuna sp. (Fabaceae) (Fig. 8): In the seeds of the so-called cow-itch plant (because of the stiff trichomes on the exocarp of the legume) L-dopa has been isolated. This is the precursor of the neurotransmitter dopamine, while Parkinson's disease is characterised by a loss of dopaminergic neurones in the brain. This has raised



Fig. 10: *Morinda citrifolia* (Rubiaceae), noni

hopes that this plant could be used as natural remedy for Parkinson's disease. A final conclusion has yet to be reached (KATZENSCHLAGER et al. 2004).

Medicinal plants in the house gardens of La Gamba (PEKAREK 2003)

In 23 domestic gardens of the approximately 100 families living in La Gamba, medicinal plants are cultivated to a certain degree. In total, 133 species are in use, the most important of which are given in table 1. It is not known to what extent these plants are actually in medicinal use.

Mujeres visionarias

A few women of La Gamba started a co-operation called 'mujeres visionarias'. They try to keep and promote the tradition of healing with medicinal plants. Dona Sara (Fig. 9), one of the most active ladies, served several times as reference person and answered questions from students of Austrian universities. She knows traditional applications of more than 100 species. However, there are no records available about the number of actually treated persons or about the efficacy of her treatment.

Plants which are in common use and which are not native to Central America:

Morinda citrifolia (Rubiaceae, noni, Fig. 10): *Morinda citrifolia* is native to the Pacific islands. The information on a traditional use is not consistent; some references mention the use of the fruit during times of famine, while other sources report also a traditional medicinal use. Since the 1980s, juices from the fruits have been promoted world wide as a panacea. The purported active ingredients as well as the huge number of patients included in clinical trials proved very quickly to be wrong. Meanwhile, research on chemical constituents as well as on pharmacological properties has been performed (POTTERAT & HAMBURGER 2007). Human clinical data are still lacking, and safety concerns were raised concerning possible liver toxicity. Despite the lack of scientific evidence noni-juice is a valued 'traditional' herbal remedy or tonic in Costa Rica. The tree is a common plant in domestic gardens; many people produce their own juice out of the fresh fruit. A glass of juice daily in the morning is said to be an effective method in order to keep fit and well.

Aloe vera (Asphodelaceae, aloe, Fig. 11): *A. vera* and other species of the genus are probably native to the Arabian Peninsula. They can, however, easily be cultivated in Central America, and large areas for commercial cultivation are located in several countries. The traditional therapeutic use belongs to the dried brown sap which can be sampled from the outer parenchyma of cut

Table 1: Frequently cultivated medicinal plants in the domestic gardens of La Gamba

Species	Family	Vernacular name	Number of gardens	Plant part used	Traditional indication
<i>Justicia pectoralis</i>	Acanthaceae	Tilo	7	Leaves	Nervousness
<i>Justicia tinctoria</i>	Acanthaceae	Azul de mata	4	Leaves	Gastritis, hair care
<i>Sambucus mexicana</i>	Adoxaceae	Sauco	5	Leaves, flowers	Cough, bronchitis
<i>Yucca guatemalensis</i>	Agavaceae	Itabo	4	Leaves, fruit	Prostatitis, abdominal pain
<i>Anacardium occidentale</i>	Anacardiaceae	Maranón	7	Bark, leaves	Diarrhoea, abdominal pain
<i>Mangifera indica</i>	Anacardiaceae	Mango	7	Leaves, stem bark	Flu, cough, torsions
<i>Eryngium foetidum</i>	Apiaceae	Culantro	20	Root	Anaemia
<i>Cocos nucifera</i>	Arecaceae	Coco, pipa	8	Fruits	Asthma, inflammation of the kidney
<i>Aloe vera</i>	Asphodelaceae	Sabila	9	Leaves	Gastritis, ulcers, skin burns
<i>Ambrosia cumanensis</i>	Asteraceae	Altamisa	4	Leaves	Gastritis, nervousness
<i>Neurolaena lobata</i>	Asteraceae	Gavilana	8	Leaves	Fever, abdominal pain
<i>Bixa orellana</i>	Bixaceae	Achiote	5	Seeds	Gastritis
<i>Opuntia guatemalensis</i>	Cactaceae	Tuna	5	Leaves	Hair care, gastritis, liver disorders
<i>Carica papaya</i>	Caricaceae	Papaya	13	Leaves	Constipation, pain of the liver
<i>Equisetum bogotense</i>	Equisetaceae	Cola de caballo	5	Leaves	Inflammations of the kidney
<i>Jatropha gossypifolia</i>	Euphorbiaceae	Fraillesillo	5	Leaves	Abdominal pain
<i>Gliricidia sepium</i>	Fabaceae	Madero negro	5	Leaves	Irritations of the skin, as repellent
<i>Senna reticulata</i>	Fabaceae	Saragundi	7	Leaves, fruits	Skin fungus, inflammations of the kidney, rheumatism
<i>Menta citrata</i>	Lamiaceae	Hierbabuena	4	Leaves	Ear pain, fever, abdominal pain
<i>Ocimum micranthum</i>	Lamiaceae	Albahaca	7	Leaves	Ear pain, abdominal pain
<i>Satureja viminea</i>	Lamiaceae	Menta	4	Young stems	Abdominal pain, nervousness
<i>Persea americana</i>	Lauraceae	Aguacate	5	Leaves, bark, seed	Arthritis, diabetes,

leaves. The dried sap is called 'aloe' and contains about 20% hydroxyanthraquinones, which exert a drastic laxative effect. Recently, the colourless inner storage parenchyma of the leaves has become a popular ingredient of cosmetics and food supplements. The activity against sunburn and other skin related diseases is well documented, while the oral uptake for stimulation of the immune system and for cancer treatment is based on some in vitro findings only (REYNOLDS & DWECK 1999). The treatment of gastritis and gastric ulcer is plausible due to the polysaccharides. The leaves of *Aloe* sp. are found in every marketplace in Costa Rica. For the treatment of sunburn, the green, hard, outer part of the leaf is cut away and the inner colourless jelly is directly applied to the skin.



Fig. 11: *Aloe* sp. (Asphodelaceae), sabila



Fig. 12: *Equisetum bogotense* (Equisetaceae), cola de caballo



Fig. 13: *Russelia* sp. (Scrophulariaceae), cola de caballo



Fig. 14: *Chaptalia nutans* (Asteraceae), arnica

Discussion

The current documentation on the traditional use of medicinal plants in the south of Costa Rica reflects the lack of a continuous tradition on a broad basis. The sparse knowledge is highly influenced by modern sources of information.

The increasing interest in traditional medicine is also caused by the interest of tourists and research institutions. Medicinal plant gardens are popular in Costa Rica today. However, they are frequently established without the necessary botanical or medicinal background. Incorrect plant identification and labelling occur very frequently.

People who try to document the traditional knowledge are confronted with further problems. Informants refer primarily to vernacular names. The correlation between such a name and a certain botanical taxon has to be established. A valuable source of information might be the domestic garden of the informant. Herbarium specimens can be prepared and identified with support of botanists of the University of Vienna and the tropical research station La Gamba or of local botanists in the National Museum in San José.

Vernacular names may stand for different plant sources. For example 'cola de caballo' is used for *Equisetum* sp. (Equisetaceae) (Fig. 12) as well as for *Russelia* sp. (Scrophulariaceae) (Fig. 13). The leaves and stems of *Russelia equisetiformis* in particular bear a resemblance to *Equisetum*, although the conspicuous red flowers of *Russelia* would allow a simple differentiation. All over Costa Rica, these two species are mentioned and used with the same indications (as a diuretic, against inflammations of the kidney). There is some scientific evidence for the use of *Equisetum* sp. in these indications. *Equisetum arvense*, a Central European species, is traditionally used in Europe in order to increase the amount of urine. In contrast, no data of the use of *Russelia* are published.

Some interesting correlation can be observed between the traditional use of plants in Costa Rica and Central Europe: for example, a plant called 'arnica' by Costa Ricans is used for the treatment of inflammations in a similar way to the Central European *Arnica montana* (Asteraceae). However, 'arnica' in Costa Rica is the vernacular name for *Chaptalia nutans* (Asteraceae) (Fig. 14). While the anti-inflammatory action of *Arnica montana* is scientifically well documented, the evidence for *Chaptalia nutans* is very poor.

Future efforts for the documentation of the traditional use of medicinal plants in Costa Rica should focus also on the differentiation between real local tradition and knowledge which has been influenced from other regions.

The views presented do not necessarily represent the views of the AGES PharmMed.

References

- ANDRADE-CETTO A. & M. HEINRICH (2005): Mexican plants with hypoglycaemic effect used in the treatment of diabetes. — *J. Ethnopharmacol.* **99**: 325-348.
- ARVIGO R. & M. BALICK (1998): Rainforest remedies. — Lotus Press, Twin Lakes.
- CÁCERES A. (1996): Plantas de uso medicinal en Guatemala. — Editorial Universitaria Univ. de San Carlos de Guatemala.
- EARLE J.E. (2001): Plantas medicinales en el Tropicó Humedo. — Ed Guayacan, San Jose.
- KATZENSCHLAGER R., EVANS A., MANSON A., PATSALOS P.N., RATNARAJ N., WATT H., TIMMERMANN L., VAN DER GIESSEN R. & A.J. LEES (2004): *Mucuna pruriens* in Parkinson's disease: a double blind clinical and pharmacological study. — *J. Neurol. Neurosurg. Psychiatry* **75**: 1672-1677.
- PASSREITER C.M. & B.E. ALDANA (1998): Variability of sesquiterpene lactones in *Neuolaena lobata* of different origin. — *Planta Medica* **64**: 427-430.
- PEKAREK B. (2003): Die Heilpflanzen in den Hausgärten von La Gamba (Costa Rica): Ethnobotanische Untersuchungen zu Anwendung und Verarbeitung. — Diploma thesis, Univ. of Natural Resources and Applied Life Sciences, Vienna.
- POTTERAT O. & M. HAMBURGER (2007): *Morinda citrifolia* (Noni) fruit – phytochemistry, pharmacology, safety. — *Planta Medica* **73**: 191-199.
- PRIDUN B. (2001): Traditional herbal remedies of the south of Costa Rica (Area de Conservacion Osa). — Diploma thesis, Univ. Vienna.
- REYNOLDS T. & A.C. DWECK (1999): *Aloe vera* leaf gel: a review update. — *J. Ethnopharmacol.* **68**: 3-37.
- VIRTBauer J. (2007): Bioassay-guided chemische Untersuchungen von tropischen Arzneipflanzen. — Ph.D. thesis, Univ. Vienna.
- WEBER A., HUBER W., WEISSENHOFER A., ZAMORA N. & G. ZIMMERMANN (2001): An introductory field guide to the flowering plants of the Golfo Dulce rainforests. — *Stapfia* **78**: 1-462.
- WIENERROITHER K. (2000): Medicinal plants of the south of Costa Rica (Area de Conservacion Osa). — Diploma thesis, University of Vienna, Vienna.

Address of author:

Reinhard LÄNGER
AGES PharmMed LCM Herb
Schnirchgasse 9
A-1030 Vienna, Austria
E-mail: reinhard.laenger@ages.at